IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
Befor the B ard f Pat nt Appeals and Interferences

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In re Patent Application of Atty Dkt. 124-838
C# M#

SMITH et al. Group Art Unit: 2839

Serial No. 09/762,805 Examiner: M. Zarroli

Filed: February 13, 2001 Date: May 9, 2003

Title: FABRICATION OF OPTICAL WAVEGUIDES

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Applicant hereby appeals to the Board of Appeals from the decision dated _____ of the Examiner twice/finally rejecting claims _____ ($ 320.00) $

☒ An appeal **BRIEF** is attached in triplicate in the pending appeal of the above-identified application ($ 320.00) $ 320.00

☐ Credit for fees paid in prior appeal without decision on merits -$ ( )

☐ A reply brief is attached in triplicate under Rule 193(b) **(n f)**

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By Atty: Stanley C. Spooner, Reg. No. 27,393

Signature: _____

#16/Appeal Brief Stan 5/16/03

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of

SMITH et al Atty. Ref.: **124-838**

Serial No. **09/762,805** Group: **2839**

Filed: **February 13, 2001** Examiner: **M. Zarroli**

For: **FABRICATION OF OPTICAL WAVEGUIDES**

* *

APPEAL BRIEF

On Appeal From Group Art Unit 2839

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TABLE OF CONTENTS

I. REAL PARTY IN INTEREST

The real party in interest in the above-identified appeal is QinetiQ Limited by virtue of an Assignment of rights from the inventors to The Secretary of State for Defence recorded February 13, 2001, at Reel 11736, Frame 713, and a subsequent Assignment from The Secretary of State for Defence to QinetiQ Limited recorded February 20, 2002, at Reel 12831, Frame 459.

II. RELATED APPEALS AND INTERFERENCES

There are believed to be no related appeals or interferences with respect to the present application and appeal.

III. STATUS OF CLAIMS

Claim 1 is the only rejected claim, with claims 11 and 12 allowed and claims 2-7, 9 and 10 objected-to in the third non-final Official Action.

IV. STATUS OF AMENDMENTS

No amendments have been submitted with respect to the claims as rejected in the third non-final Official Action.

V. SUMMARY OF THE INVENTION

The present invention relates generally to the fabrication of optical waveguides and specifically an optical waveguide with decreased propagation loss and decreased optical damage.

In the past, optical waveguides are known in which an optical fiber is provided where the core of the optical fiber and the surrounding optical material have different refractive indices. These differences provide a mechanism whereby light attempting to leave the core is "bent" back into the core either by diffraction or by reflection so as to maintain a high signal-to-noise ratio in the core.

Optical waveguides, rather than optical transmission fibers, are also known by bonding support structures and low refractive index layers on a glass substrate. Additionally, a benefit of direct bonding between layers is to decrease propagation loss and optical damage, thereby improving the transmission from optical waveguides. In such prior art optical waveguides, however, a flat lamina of material having a higher refractive index (forming the waveguide "core") is bonded between two lamina of material having a lower refractive index (forming a waveguide superstructure). Unfortunately, the large lateral dimension of such flat "core" lamina meant that the arrangement was not useful for many waveguide applications or as a single-mode waveguide.

Appellants found that by using periodically poled lithium niobate (PPLN) or other similar material as the guiding lamina, the modified region on either side of an unmodified region of the guiding lamina is sufficient to maintain optical energy in a light guiding path. Specifically, appellants found that the use of direct interfacial bonding provided a sufficient bond between the guiding lamina and a

superstructure lamina to then allow the guiding lamina to be machined down to a desired waveguide thickness. This strong mechanical and optical bond also provides low propagation loss for light traveling down the light guiding path. After proper machining of the guiding lamina, a second superstructure lamina can be bonded thereover, again by direct interfacial bonding, forming the desired optical waveguide.

Accordingly, the present invention is characterized by three layers: "**a guiding lamina of optical material bonded by direct interfacial bonding to a superstructure lamina of optical material**" and "**a second superstructure lamina bonded by direct interfacial bonding to the guiding lamina**," wherein "**the guiding lamina defines a light guiding path**" and "**the path is formed of an unmodified optical region of the guiding lamina**" and "**a modified optical region defines a boundary of the light guiding path.**"

VI. ISSUE

Whether claim 1 is obvious over Booth in view of Mallinson.

VII. GROUPING OF CLAIMS

The rejected claim 1 stands and falls by itself and specifically distinguishes over the prior art as discussed in the argument portion of this Appeal Brief.

VIII. ARGUMENT

1. Discussion of the References

Booth et al (U.S. Patent 5,402,514) teaches an optical waveguide device with "photohardenable layers." Essentially the Booth disclosure utilizes a surface upon which layers of film are provided and a laser light source is used to expose a layer of film in order to create a guiding layer.

The Examiner admits that "Booth does not disclose that the light guiding path is the unmodified region and the modified region is the boundary of this path" and this admission is very much appreciated.

While in the third non-final Official Action the Examiner also suggests that he gives no patentable weight to the claimed interrelationship between claim elements, i.e. direct interfacial bonding (DIB), the Examiner does not indicate that Booth contains any teaching of DIB. In fact Booth, because it relates to the photoprocessing addition of film layers, certainly does not suggest DIB between these film layers, especially as defined in appellants' specification and as is well known to those of ordinary skill in the art.

Thus, Booth fails to contain any disclosure of any lamina bonded by direct interfacial bonding to another lamina, and as admitted by the Examiner, fails to teach a light guiding path which is an unmodified region and a modified region being the boundary of this path.

Mallinson (U.S. Patent 4,893,907) teaches a liquid crystal device using a smectic phase liquid crystal material sandwiched between two glass plates. By controlling the polarization state of the liquid crystal material, the Examiner alleges that Mallinson provides an optical waveguide between superstructure lamina.

While in the very broadest sense Mallinson does disclose an optical waveguide, the optical waveguide is not comprised of a "guiding lamina," nor is it bonded to either the first or second "superstructure lamina by direct interfacial bonding."

Furthermore, the guiding path in Mallinson is the optically modified region of liquid crystal material. Thus, Mallinson fails to disclose the guiding lamina or the guiding lamina bonded by direct interfacial bonding.

2. Discussion of the Rejections

Claim 1 is rejected under 35 USC §103 as unpatentable over Booth in view of Mallinson. To the extent the rejection is understood, the Examiner appears to believe that Booth's disclosures of photoprocessed film layers comprise guiding lamina and superstructure lamina.

While the Examiner admits that Booth does not disclose the light guiding path is the unmodified region, the Examiner suggests that Mallinson discloses an

optical waveguide where the light guiding path is the unmodified region while the boundary is the modified region.

Again, to the extent it is understood, the Examiner appears to believe that it would somehow be obvious to one of ordinary skill in the art to substitute the liquid crystal layer of Mallinson for one of the film layers in Booth. It is also noted that the Examiner apparently ignores the claimed interrelationship between the lamina in appellants' independent claim 1, i.e. that they are bonded by "direct interfacial bonding."

3. The Errors in the Third Non-Final Rejection

There are at least four significant errors in the third non-Final Rejection and they are summarized as follows:

(a) No prior art reference teaches guiding lamina or superstructure lamina which are bonded by direct interfacial bonding;

(b) It is clear error for an examiner to ignore specifically claimed element interrelationships;

(c) There is no reason for combining references and in fact they are not combinable; and

(d) Both references teach away from appellants' claimed combination of elements.

(a) No prior art reference teaches guiding lamina or superstructure lamina which are bonded by direct interfacial bonding

Appellants' claim 1 positively recites three elements, i.e. a guiding lamina, a first superstructure lamina and a second superstructure lamina. Appellants' claim 1 also recites the interrelationship between pairs of these three elements, i.e. the guiding lamina and first superstructure lamina have a bond between them which is created by "direct interfacial bonding" and the guiding lamina and the second superstructure lamina have a similar bond between them. Thus, in order to anticipate or render obvious appellants' claim 1, there must be a disclosure in one or more prior art references of all three of the elements and both of the two recited interrelationships between those elements.

No cited prior art reference contains any disclosure of direct interfacial bonding. There is certainly no disclosure of a guiding lamina and first and second superstructure lamina bonded thereon. As a result, there is clearly no basis for a rejection under 35 USC §103 because appellants' claimed elements and elemental interrelationships are not disclosed in the prior art.

(b) It is clear error for an examiner to ignore specifically claimed element interrelationships

In the third, non-final Official Action, the Examiner states that:

> "in regard to bonding the layers with direct interfacial bonding, the method f forming the device is not germane to the issue of patentability of the device itself. Therefore, this limitation has not been given patentable weight."

The above statement is a clear admission that the Examiner has failed to consider appellants' claimed interrelationship between claim elements. As appellants noted in the Background of the Invention, DIB or direct interfacial bonding provides a benefit, i.e. decreased propagation loss and decreased optical damage. Appellants' specification also notes that the use of a direct interfacial bond between the guiding lamina and the first superstructure lamina provides a bond strength between the guiding lamina and the superstructure lamina sufficient for the machining of the guiding lamina down to a small thickness, i.e. in a preferred embodiment, 12 microns (appellants' specification page 5, lines 6-9). While this beneficial machining step is not recited in appellants' claim, it is the beneficial result of forming these structures by direct interfacial bonding relationship which is specified in the claims.

As a result, the Examiner has admitted error by failing to point out how or where any prior art reference teaches direct interfacial bonding and in particular direct interfacial bonding between appellants' claimed elements.

(c) There is no reason for combining references and, in fact, they are not combinable

Booth teaches the creation of film layers by photopolymerization and the use of a laser in order to effect such polymerization. Mallinson teaches that the

guiding layer is a liquid crystal material. There is no disclosure of how a liquid crystal material as a guiding layer (as disclosed in Mallinson) could or would be modified to be compatible with the photoresist film layers disclosed in Booth.

Moreover, as would be apparent to those of ordinary skill in the art, the liquid crystal material in Mallinson is in fact a liquid and the polymerized film layers in Booth are also relatively flexible. If the liquid crystal material of Mallinson were sandwiched between the flexible film layers of Booth, there would be no operable structure provided because the thickness therebetween would vary dramatically. As is also well known to those of ordinary skill in the art, the thickness of the liquid crystal material is critically important to determining whether it is properly polarized to pass or block light.

As a result, the combination of the Booth and Mallinson teachings not only contain no suggestion to one of ordinary skill in the art for their combination, but in fact are not combinable to form any working device. As a result, the Examiner has failed to provide any *prima facie* basis for combining the teachings of the two prior art references, save for that disclosed in appellants' independent claim 1 and the current specification. The Examiner is prohibited from using such 20/20 hindsight.

(d) Both references teach away from appellants' claimed combination of elements

As noted above, the Booth reference suggests the use of polymerized films which are coated on top of other polymerized films. There is no suggestion for using guiding lamina or a superstructure lamina or direct interfacial bonding therebetween. In fact, Booth would lead one of ordinary skill in the art away from appellants' claimed requirement of direct interfacial bonding between the lamina and suggests instead that the same result can be achieved by photoprocessing. As a result, Booth would clearly lead one of ordinary skill in the art away from appellants' claimed invention.

Similarly, Mallinson teaches that the guiding lamina should be a liquid crystal material, and thus one would merely sandwich this liquid material between two planar structures. Obviously, there are no direct interfacial bonds between a liquid crystal material and a superstructure lamina as recited in appellants' independent claim. As a result, Mallinson's teaching of liquid crystal material would lead one of ordinary skill in the art away from appellants' invention.

Where both references teach away from appellants' combination of elements, there is certainly no basis for a rejection under 35 USC §103 as obvious.

IX. CONCLUSION

As discussed in detail above, no prior art reference discloses guiding lamina which are interconnected by direct interfacial bonding with superstructure lamina. The Examiner admits that he has ignored appellants' claimed interrelationship, i.e. direct interfacial bonding which has a beneficial result, although such benefit is not claimed, nor is there any requirement for the benefit to be claimed. The Examiner has provided no reason for combining cited elements of the two references, and indeed it would be impossible to combine liquid crystal material as a guiding lamina with flexible film layers as superstructure lamina to form an optical waveguide. Finally, the Examiner apparently ignores the fact that both references would lead one of ordinary skill in the art away from appellants' unique and unobvious combination of elements.

In view of the above, the rejection of claim 1 is clearly in error and reversal thereof by this Honorable Board is respectfully requested.

Respectfully submitted,

NIXON & VANDERHYE P.C.

By: _____
Stanley C. Spooner
Reg. No. 27,393

SCS:kmm
Enclosures
Appendix A - Claim on Appeal

APPENDIX A

Claim on Appeal

1. A fairing arrangement for bridging an aircraft fixed structure and a control surface hingedly mounted on and angularly displaceable with respect to said aircraft structure, said fairing arrangement including:

a first fairing portion located on said fixed aircraft structure,

a second fairing portion located on said control surface, and

an intermediate flexible seal member disposed between said first and second fairing portions and having a proximal edge region fixed relative to one of said first and second fairing portions and a distal edge region,

wherein said flexible seal member comprises a composite sheet element of rubber or rubber-like material incorporating a plurality of reinforcing plies across at least part of said sheet element, each ply comprising one or more fabric elements, whereby the flexible seal member is deformable to accommodate differential movement between said first and second fairing portions and said flexible seal member defines a surface which generally conforms to the adjacent portions of said first and second fairing portions.